VOLUME 7
NUMBER 5
SEPT-OCT 1961
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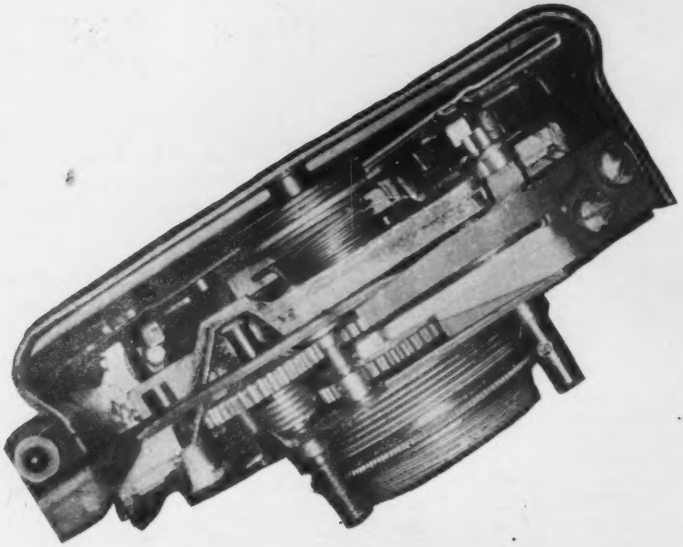
the CAMERA CRAFTSMAN



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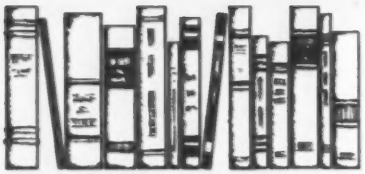

BOOK SHOP

Here are useful additions to your library of technical material. This department will regularly offer suggestions for new books you may wish to acquire. Any reference books, whether or not here listed, photographic or otherwise, will be located for you and may be purchased through National Camera Servi-Shops Supply, Box 174, Englewood, Colorado.

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the CAMERA CRAFTSMAN

Volume 7
Number 5

SEPT.-OCT. 1961

The Periodical of Photo Technology for Camera Repairmen

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Clair H. Schmitt	Technical Advisor
Lory E. Wells	Art Director
Frank H. Curtis	Advertising Consultant
LaVena Heubschman	Lithographer
Jan VanderBeek	Columnist

A Point to Ponder

By SAMUEL L. LOVE

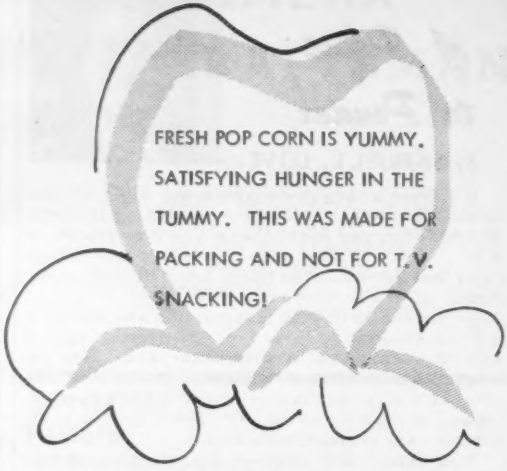
It's been a long time since the Stoic philosopher, Epictetus, said, "No great thing is created suddenly, any more than a bunch of grapes or a fig. If you tell me that you desire a fig, I answer that there must be time. Let it first blossom then bear fruit, then ripen."

Acquiring skill that is complete and useful is a time-consuming process. Some who are in search of that skill are like the young man you may have heard about. When his girl asked, "Do you believe in love at first sight?" he answered, "Well, it sure saves time!" There are no short cuts to real accomplishments.

You expect and receive a great deal of help from your instructors in absorbing the training you're after. All education, and certainly the NCRS course is no exception, is a means of presenting you with the experiences of others so that you can avoid some of the grief and cost of repeating mistakes that have already been made by some one else. You'll never be presented with a silver platter full of all the mistakes that might be made! There are many new ones possible for every one that ever went before. But with a good supply of examples and a healthy measure of intelligence and honest effort, you can avoid most and solve some problems you've never experienced with a little less frustration.

If there is any one trait that can be found in most successful NCRS students and graduates, it is this: each man or woman has learned to recognize the limitations of someone else's experience. He's learned to make the maximum use of training to speed up his growth of skill. Yet he hasn't looked on this assistance as some magic wand to be waved during his transformation from an eager student to a master craftsman. Hard work is the flame that hardens the steel of a fine mind into the keen tool of a successful graduate. Repeated from The Camera Craftsman, May-June 1959 issue.

Each day may seem to bring small progress. But consistent effort, like drops of water continually wearing away a rock will reap rewards for your efforts. -D. Elias



THIS IS NOT FOR HUMAN CONSUMPTION

"You will find a notice like this with your" shipments packed in pop corn!

NCRS'S PACKING POP CORN

There have been alot of amusing comments about the pop corn NCRS uses for packing your shipments. It no doubt looks mighty good. However, it is not intended for human consumption.

The pop corn is used to cushion and protect instruments, against the rough handling the packages receive enroute. This pop corn may have been handled by many persons and is not fit to eat! Some of it may have been swept off the floor! We advise you to dispose of it before anyone (meaning children mostly) tries to eat it.

USED INSTRUMENTS NOW AVAILABLE

USED MARK II ANALYZER. In excellent condition. Two years old. $300.00.

USED MARK II ANALYZER. In good condition. Two and a half years old. $275.00.

USED MARK III ANALYZER. Excellent condition. One year old. Also included are Eastman Kodak, Argus, Ansco, and Bell & Howell Manuals. $495.00.
Write to National Camera ServiShops Supply, Box 174, Englewood, Colorado.

Reports FROM THE CRAFTSMEN

Dick Pullen, my partner, and I are really becoming swamped with work. We now have 17 accounts in Western Michigan, and are receiving calls from more. We don't want to overdo ourselves, so we are trying not to take on too many more. A good friend of mine here in Grand Rapids is taking the course too, and will probably help us out and come in with us after he receives more training. His name is Tom Meaney. We have exclusive in-and-out of warranty with Revere and Wollensak for all of Western Michigan, and the name of National Camera ServiShops is really known.

Raymond Warnke
Grand Rapids, Michigan

The Craftsman is always a welcome visitor, the technical articles are fine and it is so nice to know what other students are doing. Also to keep in touch with all you nice people I met up there last year. I hope I can get up there again next year for a short visit. I don't want to miss an issue of the Craftsman no matter what the subscription cost is.

C. L. Wilson
Mercedes, Texas

Hello There. This is the first time I've had time to drop you a line since I finished the course with you. Things are looking good for me--more repairs than I can do.

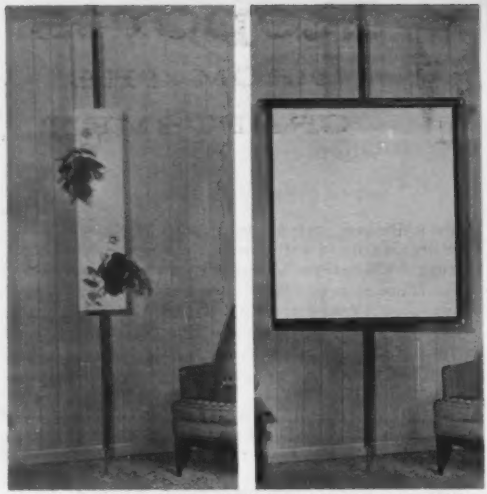
Charles Herrington
Laurel, Mississippi

I wish I had this school ten years ago when I started my business. It would have kept me from many mistakes and hard work that was unnecessary.

Franklin M. Jenks
Madison, Wisc.

Being in a related field of engineering, your training has added immeasurably to my knowledge.

Noel J. Wright
Coachella, Cal.



NEW COMBINATION HOME MOVIE SCREEN

One of the newest combinations of two-for-one is the pole screen. The pole screen will appeal to home-movie fans who want a good projection screen, and a decorative panel as well.

The pole screen is like those new lamps that come on tension-spring, adjustable poles. It uses the same idea.

The pole installs anywhere, and can brighten up the living room, recreation room, or office. It adjusts to ceilings up to 9 feet high.

On one side of the pole is a vertical decorator panel, antique white, which comes with two planter brackets and flower pots. But you can use the panel for all sorts of other decorations--pictures, shadow boxes, dart boards, shelves, lamps, and so on.

On the other side, hidden by the decorator panel, is the projection screen. It comes in a metal case. When you want to show movies or slides, you simply turn the pole around so that the screen will face your audience, lower the screen, and turn on the projector.

The standard screen measures 40 inches by 40 inches, and is made of a glass-beaded fabric.

Not only is the pole screen an attractive accessory, but when you're entertaining, you have a projection screen. There's no searching in the closet, and no rummaging through the basement.

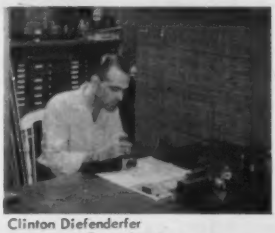
The screen case and pole are finished in black enamel, contrasting with the white decorator panel and screen. The floor and ceiling fittings on the pole are finished brass. -Precis

study shots

HERE IS WHERE NCRS STUDENTS LEARN

These are pictures of students in the shops they have set up for their training in camera repair.

Harry Lee
Santa Fe, New Mexico



Clinton Diefenderfer
Allentown, Pennsylvania

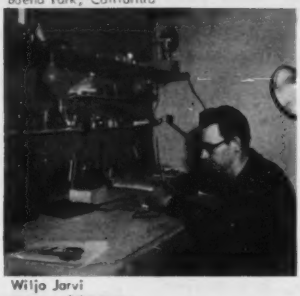
William Siegmund
Wilmington, Delaware

Donald Lindsey
Plainville, Connecticut

Mrs. Clyde Finely
Buena Park, California

Adrian Lamkin
Alexandria, Louisiana

Robert Trokey
Tinker AFB, Oklahoma



Wiljo Jarvi
Aurora, Minnesota

S. T. Rowe
London, Canada

INSIDE FILTERS

By R. D. Zakia
Hollis Todd

For YEARS the knowledge that filter X "brought out clouds" but needed twice the regular exposure, or that filter Y allowed you to use "indoor" color film outdoors has been considered sufficient filter knowledge.

But it isn't. Filters vary markedly in quality, in ability, in price and in results. Moreover, the manufacturer's exposure recommendations are often sufficiently erroneous to cause noticeable over-or underexposure. Since little has been written on the practical workings of filters, a sharp critical look at them seems in order.

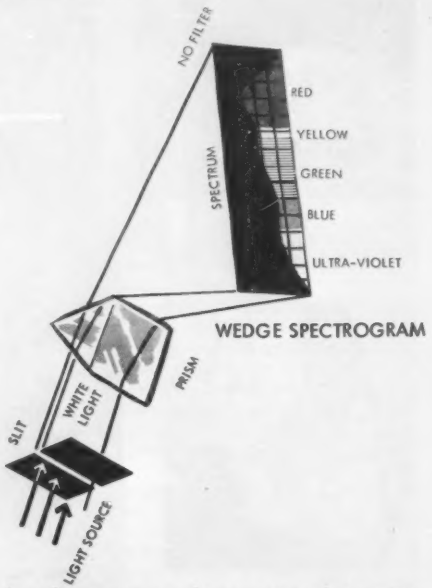
First, what does a filter do? It doesn't add clouds or anything else to the picture. Its function is to remove from a mixture of light waves those waves which for some reason are unwanted. Like any filter, an optical filter absorbs and does not add. Optical filters absorb certain specific light waves. These absorption characteristics are the key to the use and ability of a filter.

The absorption can be measured in several ways. One of the most graphic and fascinating is shown below. By making wedge spectrograms you can demonstrate photographically what happens with any filter, light source and film. You can determine the photographic results of using the filter/light/film combination but not the performance of the filter by itself.

There are a number of deficiencies in the wedge spectrogram. The results depend to a great extent on the film used as well as the light source. For instance, if you used an orthochromatic film which is insensitive to red, you would get no image in the red region of the spectrum. So for most purposes, it's better to use some recording device other than film.

If you use a calibrated photocell to measure the intensity of different spectral regions with and without the filter, you can calculate the filter's absorption at any wavelength you wish. The results can easily be plotted graphically.

Let's take an example. At some wavelength you may find a filter absorbing half the light it receives from the source. In such a case, the filter receives twice as much light as it transmits. For purpose of mathematical computation, it's easier to plot the logarithm of this value. The common logarithm of the number 2 is 0.3. This is the density of the filter at this wavelength. The density is commonly used to measure the absorption of any filter. If another filter absorbs all but 10% of the light from the source at a specified wavelength, it then receives 10 times as much light as it transmits. The density in this example would be 1.0, which is the logarithm of 10.



A wedge spectrogram shows you just what any filter and film combination will do. Light from a lamp filament is directed through a narrow slit to an optical glass wedge prism. By using either color or black-and-white film we can photograph the precise spectrum that the film will record from the light source used. By placing various filters between the slit emitting the light source and the prism which separates the white light into the spectrum, we can show the spectrum as it is changed by filtration.

Most filter data are presented in terms of a graph of filter density plotted versus wavelength. Let's take the graph curve of

Inside Filters Cont. on page 9

Permission granted to reprint from Modern Photography, July 1961 issue.

a very popular filter, the K2 (deep yellow). It shows a very low density for red and green light; the density rises sharply in the blue region of the spectrum. So a K2 filter absorbs little red or green light, but nearly all blue light. The K2 is therefore used where blue light must be absorbed for an effective picture. The most common application of a K2 filter is to darken blue skies. By absorbing the blue skylight, the filter causes the sky tone to be very light in the negative and therefore darker in the print. This effect increases the tonal contrast between the sky and the clouds.

GREEN PEPPER + RED FILTER = 0

Most suppliers of photographic filters give rather arbitrary numerical or letter designations to filters. For example, similar yellow filters are designated as follows: by Enteco, G15; by Lifa, G2; by Tiffen, 8 (Yel 2); by Wratten, 8(K2). To find out what these designations mean you must read the manufacturer's pamphlets.

There are, however, two filter designations that do have a meaning.

1. Color correction filters are coded to indicate the hue of the filter (red, green, yellow, etc.) and the absorption characteristics. For example, CC-50R specifies a red filter (blue- and green-absorbing) with a density of approxi-

Cont. on page 11

MPDFA WARNS ON RESPOOLED FILM

The Master Photo Dealers & Finishers Association warns members that there is being distributed, in various areas of the country, several different kinds of film material which is being cut and respooled and sold for amateur picture making. The material is, in some instances, wholly unsuitable for the purpose and results in failures or "no pictures".

Some of these respoolers have apparently even gone so far as to spool and sell non-sensitive "leader" strip film.

Dealers and photo finishers should take every precaution to prevent such worthless material from getting into the hands of their customers. Said R. J. Wilkinson, "We certainly don't believe that all re-spooled film material is worthless, but would certainly be suspicious of any material not plainly marked with the kind of material contained, the name of the respooler and his address with some kind of guarantee over his name. Even these precautions may not suffice. Some of this material now being distributed is described by the original maker as 'Lineograph Pan' film with a ramjet backing dye that comes off in processing'. Unfortunately it may adhere to standard films which are being processed in the same tanks at the same time, and, unless individually sponged to remove this dye-scum, spoils all the films in the run. This film was never intended to be used for hand camera photography." - Photo Weekly.

If you are not a member of SPT,...

THE NEXT SECTION OF THIS ISSUE IS MISSING

The Society of Photo-Technologists section of the Camera Craftsman is sent only to members of the Society. Don't miss the valuable articles in this section!

Write: The Society of Photo-Technologists
Box 174, Englewood, Colorado.

To help you keep your SPT sections in proper sequence the pages will be numbered consecutively. Beginning with this issue the right numbers will be printed.

The pages will start with number 1 in your Jan-Feb 1961 "Craftsman". Just change your page numbers in the sections printed since then.

SPT
THE SOCIETY OF PHOTO-TECHNOLOGISTS

Measuring and Testing LENSES

Continued from page 16

by G. Barnstedt

One technique devised by Sewig involves moving a line grating with a known diffraction constant to-and-fro in the focal plane of the collimator. The image of this grating formed by the lens being tested is scanned photo-electrically through a slot, which will indicate the focal plane when the contrast is greatest (i.e. when the alternating current generated by the photo-electric receptor is greatest). Here likewise, the constant should be measured before and behind the focal plane, by placing the grating on one half of a rotating drum, the axis of which passes through the focal point of the collimator. The slit therefore receives light successively from the image of the grating formed alternately before and behind it; This therefore determines the focal plane, since equal contrast is indicated by both images. This comparison can be made electronically and checked by a measuring instrument.

The Mount-distance

So far we have only considered the determination of the focal plane, or in more general terms, of the image plane of a lens. We must now relate the position of the focusing plane to the system. By giving the back-focus, we specify the distance of the focal point from the rear lens-apex of the system. Easier to measure is the mount-distance, which is the distance from the focal point of the outer bearing surface of the mount; this is the surface with which the lens mount bears on the bearing surface of the camera when the lens is screwed in. The mount distance is not in itself a constant of the system, but depends considerably on the construction of the mount. For measurement, the lens mount must be provided with a suitable surface. Then the mount-distance can easily be measured with a mechanical device (such as a depth-gauge or a dial extensometer, possibly with the assistance of end-measurements) as the distance of the bearing surface of the mount from the ground glass screen, the film emulsion or the intercepting test object.

The mount-distance is a value of significance only in the fitting of a lens to a camera. It must be adhered to with particular precision in the case of lenses which are interchanged on the camera as required, since not every lens can be adjusted individually to suit the camera.

When visually adjusting lenses to a specified mount-distance, it is not advisable to set an absolute numerical value. As we have pointed out before, with different apparatus and observers, the image plane can be located in a variety of completely different positions; in fact, differences may occur which are significantly greater therefore avoid the measurement of precise numerical values but take instead one or more lenses which have been previously evaluated by means of photographic exposures, to ensure that in the appropriate camera the focal point is in the correct position. These samples should be compared with other lenses of the same type. The differences in the position of the image plane in two lenses can thus be assessed much more accurately. It is only necessary to set the two lenses by means of the same criteria, without having to decide whether one has arrived at the correct focal plane. Nevertheless, it must be realized that by visual measurement the difference in flange-distance may be measured incorrectly, by 0.01 to 0.02 mm. Since the permissible tolerance for the lens given as an example is only $\pm$ 0.02 mm, it is difficult to stay within these tolerances in any case. The photo-electric method of differential measurement is much safer, however, since it involves a measurement-error of only a few μ.

The Back-focus

While the checking of the mount-distance is principally of necessity in connection with lenses produced in series, with individually-manufactured sample lenses, we are more concerned with the back-focus which is the distance of the image-point from the apex of the rear lens element. If no other data are given, this refers in

particular to the focal-point back-focus. This is therefore a constant, depending solely on the lens design and not on the construction of the mount.

The back-focus can be established by means of the mount-distance, by deducting from it the distance between the rear lens-apex and the plane of the bearing-flange of the mount. Alternatively, it is possible to measure directly the distance of the ground-glass screen or the receiving test object from the rear lens-apex by means of precision calipers. However, this making physical contact with the lens element or the receiving screen can cause damage and lead to new sources of error. To avoid these, the microscope should be focused on the aerial image and then moved until any dust, etc., which may be lying on the rear lens-apex is defined sharply. The extent of the movement is identical to the back focus.

The Focal Length

The focal length is the distance between the focal point and the principal point of an optical system. The direct determination of the principal point will involve some difficulties since it lies somewhere either inside or outside the system. Moreover, in systems with finite apertures, the principal point is as elusive to define as the focal point. After all, it is only the point of intersection of the optical axis with the principal plane, which itself may possess a somewhat complicated form that may be altered by the angle of the incident rays.

However, there are different methods of measuring the focal length, other than by determining the distance focal point - principal point. It is the focal length which determines the relative size of the image. It is possible to use the various image-formation formuli for measurement, by measuring the other elements appearing in the equation with sufficient exactitude and then calculating the focal length.

Since image aberrations affect the measurement of the focal length, it is possible to arrive at differing values when employing various techniques, for the reason that image aberrations have differing effects in addition to the systematic errors inherent in the measuring equipment.

When the focal length depends upon correct focusing on the focal plane, it is also necessary to specify the back focus.

Moessard's Method of Determination of the Rear Principal Point

In this method, the lens is inserted in a holder, which it can be moved along the axis. The holder can be rotated and its axis of rotation intersects the optical axis perpendicularly at D (Fig. 21). The image of an object at an infinite distance formed by the lens under test is observed on a ground-glass screen by means of a microscope. If the lens is swung backwards and forwards slightly around axis D, the image on the ground-glass screen generally moves likewise (Fig. 21). When sliding the lens along the axis, a position will be found in which the image remains stationary despite the swinging of the lens. In this case the axis of rotation passes through the rear nodal point (in air-spaced systems equivalent to the rear principal point H'). In this way the principal point H' is finally determined by the position of the center of rotation D (Fig. 21). When moving the lens along the axis the ground-glass screen must naturally be moved also, so that the image always remains sharp; only the axis of rotation passing through D remains unchanged.

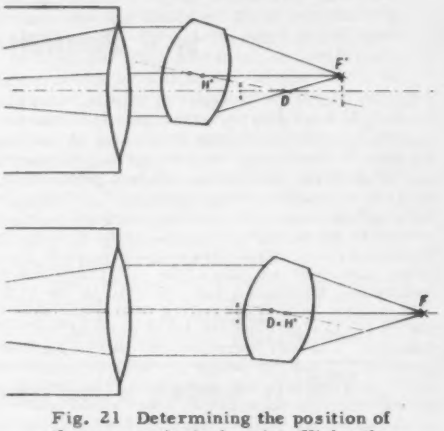


Fig. 21 Determining the position of the rear principal point H' by the Moessard method

If the lens is swung to and fro around axis D, the rear principal point H' and thus the focal point F' will also move.

Only when the lens is moved so that the axis of rotation passes through the principal point, so that D and H' coincide, will the focal point F' cease to make any lateral movement.

One can measure either the distance between the axis of rotation and the ground-glass screen (which corresponds to the focal length), or the distance between the rear lens-apex and the axis of rotation (which corresponds to the principal-

point back-focus), and thus determine the focal-point back-focus.

The degree of precision is dependent upon the accuracy with which the ground-glass screen is focused in the focal plane, and the principal point made to coincide with the axis of rotation. Both errors are additive; the first error has been mentioned in the discussion of the image-plane adjustment. Inorder to assess the second error, it is necessary to know which of the lateral movements of the image can still be seen; the distance di (rotation-axis to principal point) is a function of this lateral movement dy'. When swinging through a small angle σ, the following formula applies:

$$di = \frac{tg\,\sigma}{dy'} .$$

Formula 19

When dy' - 0.01 mm and $\sigma = \pm 1°$, di = 0.3 mm.

Since the error is not particularly dependent on the focal length - although dy' does depend on it somewhat - this method is only suitable for greater focal lengths, from approximately 100 mm.

For shorter focal lengths, indirect methods which employ the assistance of other dimensions will prove more suitable.

Measuring with the aid of image-formation equations.

The best method is to employ the image-formation equation used for defining focal length in DIN 4521:

$$f = \lim_{\sigma \to 0} \frac{y'}{2\,tg\frac{\sigma}{2}} .$$

Formula 20

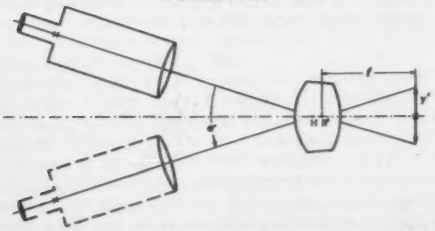


Fig. 22 Measuring the focal length by means of the angle of inclination of the principal ray and the image size y'.

Spectrometric Methods

A test object with two marks which are symmetrical about the optical axis and with a known distance y' between them, is placed in the focal plane of the lens under test. A telescope in front of the lens is focused on each of the two marks in succession, and the angle σ, through which the telescope must be swung, is then measured. In actual practice, this can be done by placing the lens under test on the stage of a spectrometer, so that the front principal point lies on the axis of rotation (Fig. 22). Because of the distortion of the lens, the focal point depends on the angle at which the measurement is made. It is not possible to measure the axial focal length at a zero angle. Some assistance can be gained by making a series of measurements of different angles and interpolating the axial focal length diagrammatically.

This is one of the most accurate methods. If all sources of error are taken into consideration, it can safely be assumed that the error will be smaller than 0.1%.

Techniques involving the measuring of the image size at a given angle.

Here two marks are provided, at a given angular distance, in the object space. These two marks are best placed in the focal plane of a collimator. The angle is then established thus:

$$tg\,\frac{\sigma}{2} = \frac{y_k}{2\,f_k} .$$

Formula 21

Here y_k is the distance between the two marks and f_k is the focal length of the collimator. Both values must be measured accurately together, and provide a constant for the apparatus. The lens under test forms an image of the two marks, and the distance y' between them gives an indication of the front focal length as shown in Fig. 23.

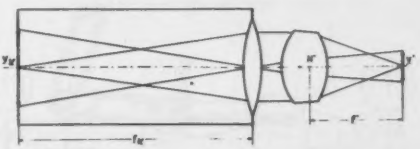


Fig. 23 Measuring the focal length by the Porro method, with the aid of two test marks in the focal plane of a collimator.

The accuracy of the measurement depends principally on the accuracy with which the image size y' can be measured. If this error is no more than ± 1 μ, the error in determining the focal length will be smaller than 0.3%.

$$f = \frac{y'}{2 \operatorname{tg} \frac{\sigma}{2}} = \frac{f_k}{y_k} \cdot y'.$$

Formula 22

Von Hofe's Comparator Method

The Von Hofe comparator method employs a similar principle. It only permits comparitive measurements, but is very accurate. In this case the comparison lens acts as a collimator for a test object employing three double lines spaced at equal distances. In the focal plane of the lens under test is placed a receptor test-object with 3 lines, spaced at exactly the same distances apart as the centre-points of the double lines used in the other test chart. When the focal lengths of both lenses are identical, the image of the single lines will fall exactly between the double lines. Another method for determining the difference in focal length is to measure the difference in size between the image and the receptor test object. To do this, the receptor test object is moved laterally, so that the single and double lines coincide twice, once to the left and once to the right, measuring the displacement $\Delta y'$; the difference in focal length is then:

$$\Delta f = \frac{f}{y} \cdot \Delta y'.$$

Formula 23

Where f is the focal length of the lens used as a collimator and y is the distance between the two marks as shown in Fig. 24

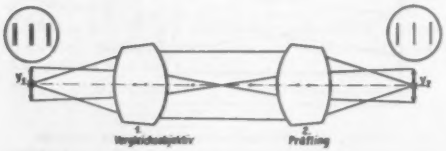


Fig. 24 Focal-Length Comparator

This method is suitable for use in all circumstances where it is necessary to measure differences in focal length with great exactitude, and whenever it is essential to select lenses with absolutely identical focal length. Only lenses of the same type should be measured by this method, by which it is possible to reduce the error to ± 0.01%.

If the test object is not at infinity, the object-size y must be inserted in the image-formation equation instead of the angle σ and the magnification-ratio must be measured:

$$\frac{y'}{y} = \frac{f'}{z},$$

Formula 24

Where z is the distance of the object from the front focal point of the lens.

Object Size and Distance Known

A test object, with 2 marks spaced at a known distance y, is placed at the greatest possible, accurately-measured distance z from the front focal point of the lens under test. With a microscope, focus the image of the marks sharply and measure their distance apart y'. At sufficiently great distances the error will be about ± 0.1%.

With some alterations, the above method is suitable for taking series of measurements, since it is convenient and speedy. The path of the rays is reversed as usual; the 2 marks spaced at a known distance y' in the image space are projected on an enlarged scale in the object space and the value y is measured. This is best done by arranging for the image to be received on a scale. Moreover, it is now only necessary to establish the distance e between the test object and the receptor screen and the distance of the principal plane, i (Fig. 25). Then the focal length can be calculated by the equation.

$$f' = \frac{\frac{y'}{y}(e - i)}{(1 - \frac{y'}{y})^2}.$$

Formula 25

(continued on page 21)

We are indebted to Mr. Norman C. Lipton, Photographic Information Service, New York, N. Y.; and Jos. Schneider & Co., Optische Werke, Kreuznach, Germany for what we believe is a very informative article on "Measuring and Testing Lenses." -Ed.

Inside Filters Cont. from page 9

mately 0.05 for blue and green light. (This corresponds to an absorption of about 2/3 of this light.) Similarly, CC-30M refers to a magenta (green-absorbing) filter with a density of 0.30 for green light, and an absorption of about 1/2.

2. Color balancing filters are often coded with a value in "decamireds." The reason is that these filters change the color temperature of the light reaching the color film, and the change depends not only on the filter but on the color temperature of the light source. So it is convenient to express the value of both in the same units--in this case, decamireds. The decamired value for a light source is calculated by dividing the color temperature into the number and multiplying this number by 100,000. For example, a color temperature of 5000K would have a decamired value equal to 1/5000 x 100,000, or 20 decamireds. As an illustration, here's how you can calculate the decamired value of the filter required to change a color temperature of 3850 to 3200:
3850--1/3850 x 100,000, or 26 decamireds.
3200--1/3200 x 100,000, or 31 decamireds.

The difference--31-26, or 5--is the decamired value of the required filter.

WHAT DOES A FILTER FILTER?

What actually occurs when you use a filter? In general, whenever sensitive black-and-white film is exposed through a moderately dense filter, several changes take place in the response of the material.

First, since the light level is cut, the film responds less, unless you use a larger lens opening or longer shutter speed. In addition, there usually is a contrast change if the negative is developed normally. For most emulsions, the contrast will be less than normal if the material is exposed with a blue filter, and higher than normal if the material is exposed with a red filter. A yellow filter usually produces a slight contrast increase since blue light is absorbed by the filter. There may also be changes in the tone reproduction characteristics of the film particularly in the shadow areas.

Since the light reaching the film is restricted by the filter, some sort of exposure compensation must be made or the film will be underexposed. Film or filter manufacturers supply an approximate factor to be used. By multiplying your exposure by the factor, you get the required camera setting. (For instance, if the correct exposure reading is f/4 at 1/30 sec. without a filter, the proper exposure with a filter having a factor of 2 would be f/4 at 1/15 sec. or f/2.8 at 1/30 sec.)

(Cont. next issue)

BOOK REVIEW

Photographic Optics by Allen R. Greenleaf. The Macmillan Company, New York. 214 pages. $6.00.

The author, Allen R. Greenleaf, is a graduate of the Massachusetts Institute of Technology, a member of the Optical Society of America, and an Associate of the Royal Photographic Society of Great Britain.

While the photographer has ample information on almost every other aspect of photography, he has been obliged, for the most part, to take the manufacturer's word for the properties of lenses. As a result, something approaching a mythology has arisen about the attributes of well-known lenses. This book helps to correct this situation with understandable information about the facts and fallacies of photographic optics.

The author explains the principles of geometrical optics, describing the various aberrations, their effects, and the methods by which they are minimized in photographic lenses.

He analyzes the different types of photographic lenses now used, pointing out their deficiencies as well as their merits. Present-day lenses are often derieved from older designs and many drawings and specifications of both old and newer lenses have been included showing the trend of lens design from early types. Methods of testing lenses are described. This information gives the prospective purchaser invaluable assistance in obtaining good equipment. Estimation of correct exposure, which became a "serious problem" only in recent years after exposure meters achieved mass distribution, is discussed.

In the last part of the book there is related information on optical accessories. The principles and use of focusing mechanisms are explained, with practical information on the efficiency of shutters and the function and operation of such equipment as supplementary lenses, filters, polorizing plates, view and rangefinders.

The performance of any optical system is subject to limitations imposed by the phenomenon of diffraction. It is an apparent bending of light rays around the edge of an object. Diffraction has an important bearing upon the type of image formed by a lens. The sizes and relative illuminances of the various zones of diffraction are discussed in Chapter 4.

Final chapters discuss the principles of perspective, the application of projection printing to the production of a rectified picture, and the principles and applications of stereoscopy. Available from ServiShops Supply, Box 174 CC, Englewood, Colorado. - D. Elias

Your
ServiShops
QUESTIONS...

By Clair Schmitt, Editor

? ? ? ? ? NEED HELP ? ? ? ? ?

In this column I'll try to answer any camera repair questions you may have. Names will be withheld if requested. Address your questions to: Clair Schmitt, The Camera Craftsman, Box 174 CC, Englewood, Colorado.

Q. I have to clean the shutter on an old model Contaflex single lens reflex camera. How do I remove the focusing ring and other parts to get to the shutter? This is the model having front cell focus.

C. Mendoza, Jr.

A. Remove the three set screws from the footage scale ring. Then turn the footage scale ring around the focusing ring until a set screw is visable in the focusing ring through one of the holes in the footage scale. There are three set screws in the focusing ring that must be located in this manner, and loosened. The focusing ring and footage scale will then lift off the lens mount. The lens can be removed and normal disassembly of the shutter followed.

Q. I've got to get into the top of a Petri 2.8 camera to investigate a problem. Please tell me how to do it.

Jack Williamson

A. Remove the flat retaining screw from the counter dial and the film advance lever using pointed tips in the Multispan Wrench, or a similar tool. Then lift off the film advance lever and counter dial parts. Next remove the small counter-sunk screw near the release button and unscrew the chrome flange from around the release button itself. Usually finger pressure is all that is necessary but possibly a small Flexi-Clamp Wrench will be needed to loosen this flange. Open the back of the camera and, while holding a screw-driver or other tool in the fork of the rewind shaft, unscrew the rewind knob itself. Next remove the two screws visible under the rewind shaft and the top can then be lifted from the camera body. The top may fit quite tight and care should be taken not to distrub the shims that may be present beneath the hood.

HELP WANTED

A card to NCRS Placement Service will bring more details about these opportunities. Include code number listed for opening that interests you.

DOG SLEDDERS!!

Here's a great opportunity to own what is reported to be the finest Camera Repair Shop in Alaska! This shop was established in 1950 and is well known throughout western North America, Western Canada, The Yukon, and Alaska. A modern, convenient, and well-equiped shop with 650 square feet of floor space. The owner is asking $12,500, cash and possible terms available requiring half down. He is forced to sell because of eyesight difficulties.

For more details write Air Mail to Hoschouer's Camera Hospital, Mr. Robert O. Hoschouer, 333 B Street, Anchorage, Alaska.

138 Motion picture camera repairman needed who has experience on Mitchells, Bell and Howell, and Arriflex cameras. Our business is primarily in the motion picture field and we want a man willing to specialize. Hollywood, Calif.

1915 Hobby Shop wants two National Camera Repair School Graduates for expanding repair department. Detroit, Michigan.

11113 Need repairman who knows focal plane shutters and foreign made cameras. Portland, Ore.

177 Photo and Music Shop needs advanced student or graduate camera repairman in modern establishment for full time employment. Miami, Fla.

1822 Will interview graduates of NCRS for repair of aerial, movie, and other cameras. Van Nuys, California.

121 Our company would appreciate applications from graduates of National Camera Repair School. North Hollywood, California.

01214 Want NCRS Graduate or experienced repairman who is resident of Pittsburgh, Pa. area. Willing to consider an NCRS student who is near to graduating.

1916 Well established shop located in Rapid City, South Dakota, needs two more people.

Dealers --- Repairshops --- Service Departments

When you need repairmen, send details to NCRS Placement Service. Your needs will be listed here. Applications of interested repairmen will be sent for your consideration.

Hi There!

from Jan VanderBeek

O Happy day! We're at work in our new building and everyone is settled again (after a slight bit of move-itis). Oh, and what a time we've had! Some of you probably realize this in not getting your answers to letters as promptly and lessons as fast as usual. But you needn't worry because now things will be going smoother and smoother.

For some of you who are new to our NCRS family, we now have two buildings. TECHNICAL SERVICES, where we have our ServiShops Headquarters, Supply, Mailing, Shipping, Bindery, Printing, and Analyzer Production Department; and the STUDENT SERVICES building where the Instruction, Student Service, Accounting, and Editorial Departments are located.

I hope we will continue to have so many nice visitors as we had this year. It is so nice welcoming students and showing them around. Even if you are just passing through our city or visiting here, come out and talk with us.

The past few months have brought about meeting some new employees as well as students here for resident training. We have a new face in the Repair Department, Ted Kulick, a former Canadian now studying to be a fine American. Ted is a graduate of NCRS and a top-notch repairman. He has been kept busy with Mr. Montalvo from Puerto Rico, Mr. Jakway from California, Mr. Thomas from Idaho, Mr. Narus from Mass., Mr. Jackson, Indiana, Mr. Mangold, Wisconsin, Mr. Harry Higashi, Canada, Mr. Brown, California and several others who have just stopped in for a short visit.

Say, the Analyzer business is really "booming" lately. We have more people working on the wonder machine. Jack Olson, the Department Head, recently added Stanley Ferguson to the production line.

Someone handed me a little book not too long ago entitled "Be Polite and Live Longer" (guess I should take a little advice from it). No, really there are a lot of nice little tips in it, and I'd like to pass them along to you. Did you know that "every time you bring happiness or pleasure to others, by some act of courtsey or thoughtfulness, you add a solid plus-mark to your personality."?

Our Students Speak

Through camera club members you gain a closer association with individuals that all have the same interests at heart. They want good pictures and I want them to understand their cameras to be sure they obtain the kind of pictures they want.

For instance: Make arrangements to attend a camera club and ask the club secretary to have some of the members bring their cameras unloaded to the meeting for shutter tests and evaluation. Have charts (large) showing opening and closing time, and the effect it has on the aperature setting and exposure being made. Explain this to them, then with the Motion Analyzer give them an actual demonstration that they can see for themselves.

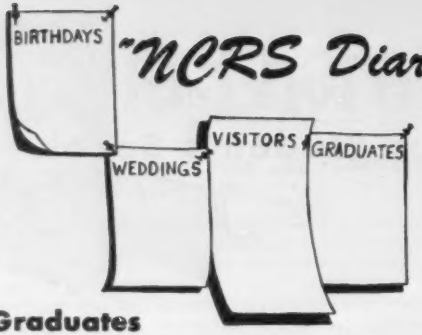
Think of the business you could derive from just such a session as this! They will all want an evaluation chart made of their cameras at various settings, with proper exposures. Give them a price as a group for evaluating their shutters.

Think what can come from a session such as this, you have given them PROOF as to your knowledge of cameras, made them happy because they are now better able to understand some things that previously have been sort of a mystery to them. They have more confidence in their picture taking ability.

They will seek you out for advice and diagnostic appraisal, they know you have the equipment and understand it and can use it. How can you better sell yourself than to give visual proof of your qualifications?

Building a reputation takes time and good workmanship; all of the time cannot be chargeable, but good workmanship can, and both of these will, in time, pay off in CASH.

Lorenzo Hall
Clearwater, Florida



Graduates

Ralph O. Brown	California
Tom Harada	California
Max C. Martinez	California
Ira D. Smith	California
Harry Higashi	Canada
Frederick A. Steel	Canada
James Keck	Idaho
J. L. Stites	Idaho
Louie H. C. Besse	Illinois
Frank P. Fritz	Illinois
John G. Castello	Maine
Richard W. Wilson	Missouri
Frederick C. Roth	New Jersey
Edward G. Cantin	New York
Allyn Humphreys	North Carolina
Adolph Senn	Ohio
Richard L. Quirk	Ohio
Carl J. Wild	Ohio
Lawrence V. Mangold	Wisconisn
Certificate of Completion:	
J. P. Lapolice	Canada
Donald A. Blessum	Illinois
Kent Anderson	Texas
Franklin M. Jenks	Wisconsin

Birthdays

A son, Michael David, born to Mr. & Mrs. Charles E. Chapman, Stu. #2388, May 4, 1961, weighing 8 lbs. 6 oz.

Born July 6, 1961, a son Paul Tracy to Mr. & Mrs. Robert E. Oelkaus, Stu. #2129.

Weddings

Miss Iris W. Morgan, Stu. #2032, one of those rare but energetic gals, was married recently to Mr. Lancaster. The couple is residing at Ontario, Canada.

Mr. Richard Slatton, Stu. #2459, was married to Alice Lorraine Dare. They are making their home at Osceola, Indiania.

BELLOWS

Have we heard from you lately?

Today, I received my diploma from you - a long awaited document which officially proclaims me to be a Camera Craftsman.

First of all, I want to thank all of the NCRS organization for the personal attention and guidance extended to me during my schooling period.

I am aware of the difficulties imposed upon teachers of technical subjects when the class has a mixed background of education and experience. These difficulties probably multiply considerably when teacher and students never see each other.

If my self-evaluated education is any criteria, your organization is doing a splendid job.

I had planned to complete this course in less time than I did, but due to the fact that I was studing Mechanical Engineering subjects at the University of Dayton, concurrently with my Camera Repair Course, the camera repair lessons often fell into second place.

Nevertheless, I maintained my NCRS education to the Honors level and still kept my M. E. E. point average up.

My second reason for writing this letter, is to officially apply for the NCRS Franchise for Springfield, Ohio and Clark County, Ohio.

I hope to eventually build my business coverage to warrant applying for franchises in neighboring counties. Clark County, of which Springfield is the center, houses approximately 100,000 people, 75% of whom reside in Springfield.

Efficient coverage of this area should prove to be a profitable venture.

Thank you once again for all your kindnesses.

Richard L. Quirk
Springfield, Ohio

Thank you for the sample copy of the Camera Craftsman. I found it very interesting and I wish I could have more of them no matter what month or year they were published. Some of the contents are of timeless value. Thanks again, I surely appreciate it.

Leo Greenbaum
Hicksville, L.I., N.Y.

SERVISHOP PRODUCT GUARANTEE

When you purchase a ServiShops product, you are sure you're getting the best of equipment. Every product advertised in the Camera Craftsman carries three warranties.

First, you have a ten-day return for refund privilege. If, for any reason, you're not satisfied, you can return your order within 10 days of purchase, for a full refund.

Second, all materials and workmanship of NCRS manufactured products are guaranteed by NCRS for one full year. NCRS will replace any parts or components which might become defective in normal use, if returned to the factory, transportation charges prepaid, within one year of original purchase.

Third, all products and parts handled by NCRS are guaranteed by the individual manufacturers of those products.

National Camera Repair School further guarantees to check and service any ServiShops product no longer within the warranty period, at nominal charge.

NCRS ORDER BLANK Date _____ 19__

You can order any product advertised in the Camera Craftsman. All products carry the NCRS Return Privilege Guarantee -- Satisfaction or return in 10 days for complete refund!

Shipments are F. O. B. Englewood (Denver), Colo.

Acct. No. _____

Name _____

Street _____

City _____ State _____

How shall we ship? How will you pay?
Parcel Post Cash
Railway Express C. O. D.
Other _____ Other _____

Quantity	Name and Description	Price
	minimum Postage	**.30**
	Total	

Minimum Order - $2.00 Signature _____

VIRGINIA CAMERA SERVICE OFFERED FOR SALE

Mr. and Mrs. Manuel L. Schlom, proprietors, of Virginia Camera Service plan to retire after 17 years of business experience.

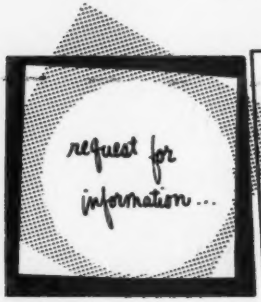
The shop located at 613 West 35th Street in Norfolk, Virginia, does an active merchandise, rental, and repair business.

Mr. Schlom is willing to assist the purchaser in becoming familar with the business and invites inquiries from anyone who is interested.

Did you ever hear of a hen demanding more pay, shorter hours, more benefits, or a guaranteed wage? Did you ever hear of one cackling out a strike call for shorter hours and less work?

Not a hen. She saves her energy for digging and her cackles for accomplishments -- eggs. She knows success comes from digging.

Scandal Sheet



NATIONAL CAMERA REPAIR SCHOOL

Box 174
Englewood, Colorado

I am interested in the opportunities and advantages of a career in Camera Craftsmanship. Please furnish me with complete information about your training program.

Name_____ Age _____

Street_____

City_____ State _____

If you have a friend or relative who may be interested in the money making opportunities that exist today in the camera repair field, have him or her fill out this coupon and mail it to the National Camera Repair School, Box 174, Englewood, Colorado.

751-1

MULTISPAN WRENCH

$8.50

Here is the precision spanner wrench designed especially for optical and camera work. It will serve you economically, for the tool accepts replaceable and interchangeable tips. Quickly adjustable from 0" to 4" (even more with proper tips), you lock the setting firmly with a single motion. The MultiSpan's versatility is unmatched because of the many varieties of tips you can use. You can instantly snap a tip for almost any application into one of two positions. Get a complete set of tips which you can use in pairs or in combination with each other.

Blanks with the tip unground are also available. These tips are already heat treated, and plated. You can grind the blade to the required shape for many of the hard-to-get-at retaining rings. Prices shown are per pair.

751-2 Tips, straight, flat, ground.....1.60	751-2u Tips, straight, flat, unground.....1.30
751-3 Tips, straight, pencil point.....1.60	751-3u Tips, straight, point, unground.....1.30
751-4 1/8" offset, flat, ground.....1.80	751-4u Tips, 1/8" offset, flat unground.....1.50
751-5 1/4" offset, flat, ground.....1.80	751-5u Tips, 1/4" offset, flat unground.....1.50
751-6 3/8" offset, flat, ground.....1.80	

THE CAMERA CRAFTSMAN from

NATIONAL CAMERA REPAIR SCHOOL

Box 174
Englewood, Colorado

Form 3547 Requested